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Michalakus, a remarkable new genus of microchaetid earthworm from South Africa (Oligochaeta: Microchaetidae)

by

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ABSTRACT

The new genus *Michalakus* is described based on *M. initus* sp. n., which is also described and illustrated. Relationships with other genera of Microchaetidae are discussed. A key to genera is provided.

INTRODUCTION

Among the undescribed microchaetids in the Natal Museum Oligochaeta collection, a new species was found characterised by the possession of two pairs of nephridia per segment and two gizzards situated in two segments: one in 7, extended slightly into 6, and the second in segment 9. In all presently recognised genera of Microchaetidae this combination of characters was not previously noted. The present paper contains the description of the new genus *Michalakus*, with *M. initus* sp. n. designated as its type species.

HISTORICAL PERSPECTIVE

The systematic status of the Microchaetidae, and the number of genera included in this family, has had a somewhat confused history. At one time this taxon was regarded as subfamily of Glossoscolecidae, raised to a family position, or reduced to the level of a tribe within Glossoscolecidae (Perrier 1872 1886, Benham 1890, Beddard 1895, Michaelsen 1900 1913 1918 1921 1928, Stephenson 1930, Jamieson 1968 1978 1980 1988, Brinkhurst & Jamieson 1971, Gates 1972 1974).

According to Michaelsen (1918), the subfamilies Microchaetinae, Lumbricinae, Glossoscolecinae, Criodrilinae, Sparganophilinae and Hormogastrinae were natural groups within the family Lumbricidae *sensu lato*. The same author, however, subsequently elevated these subfamilies to the rank of families, and gathered them in a superfamily 'Lumbricina' (Michaelsen 1928). Microchaetidae *sensu* Michaelsen incorporated the genera *Alma* Grube, 1855, *Glyphidrilus* Horst, 1889, *Callidrilus* Michaelsen, 1890, *Kynotus* Michaelsen, 1891, *Drilocrius* Michaelsen, 1918, *Microchaetus* Rapp, 1849, and *Tritogenia* Kinberg, 1867. *Geogenia* Kinberg, 1867 was accepted as a junior synonym of *Microchaetus*, and *Brachydrilus benhami* Michaelsen, 1900 was transferred to *Tritogenia*.

In the following decades *Kynotus* and *Alma* were upgraded to family positions; *Callidrilus*, *Drilocrius* and *Glyphidrilus* were included in Almidae (Jamieson 1978 1980). In Microchaetidae remained *Microchaetus* and *Tritogenia* (Reynolds & Cook

1976 1981 1989 1992). At various times, certain authors have referred to Microchaetidae with no precision as to which genera were included in the family (Yamaguchi 1953, Bouché 1972, Sims 1978 1980, Kasprzak 1982). In my earlier papers (Plisko 1991*a* 1991*b* 1992 1993*b* 1995*a* 1995*b*), and in a few others (Plisko & Zicsi 1991, Reynolds 1993), Microchaetidae incorporated the genera *Microchaetus* and *Tritogenia.* With the new genus *Proandricus* added by Plisko (1992 1993*a*) and with *Michalakus* gen. n., the number of genera in Microchaetidae is now raised to four.

The new definition of the family Microchaetidae given below comprises features proposed for microchaetids by Michaelsen (1918), Stephenson (1930), Brinkhurst & Jamieson (1971) and Gates (1972), together with other data gathered during the course of my studies on the large collection at the Natal Museum.

CHARACTERS OF THE MICROCHAETIDAE

Dorsal blood vessel anteriorly single or double. Subneural vessel absent. One or more oesophageal gizzards present in area 6–9: one gizzard in 7, or 6–7 (*Microchaetus, Proandricus, Tritogenia*); two gizzards, one in 7 extending to 6, second in 9 (*Michalakus*). Calciferous glands present, restricted to region 9–11. Typhlosole present. Excretory system consisting of one pair of holonephridia (*Microchaetus* and *Proandricus*), or with two or more pairs per segment (*Tritogenia* and *Michalakus*). Holandric or proandric. Spermathecae in single pairs or multiple. Genital glands present or absent. Dorsal pores absent. Copulatory sacs and prostates absent.

Secondary annulation present. Prostomium prolobous. Setae minute in lumbricine arrangement. Lateral lines absent. Nephridial pores present or absent. Spermathecal pores in intersegmental furrows as single pairs or multiple. Clitellum and tubercula pubertatis present in mature specimens. Genital fields present or absent. Female pores paired, on 14. Male pores paired, behind testicular segments. Papillae present or absent.

Number of taxa: Four genera; 67 species (one uncertain).

Distribution: Known only from southern Africa (two species from unknown type localities).

KEY TO GENERA OF MICROCHAETIDAE

1. Two oesophageal gizzards, one in 7 extending into 6, second in 9 .... **Michalakus** gen. n.
– One oesophageal gizzard 2

2. One pair of nephridia per segment 3
– More than one pair of nephridia per segment .... **Tritogenia**

3. Holandric .... **Microchaetus**
– Proandric .... **Proandricus**

TAXONOMY

Michalakus gen. n.

Etymology: Named in honour of my late father, Mr Julian Michalak. Gender masculine.

Type species: *Michalakus initus* sp. n., by present designation.

Diagnosis: Some of preclitellar septa thickened. Two oesophageal gizzards present: one in 7, extending into 6, and second in 9. Calciferous glands present, in 10; extramural. Dorsal blood vessel preclitellarly double, crossing septa 4/5–11/12 double; in 13 and the following single; lateral longitudinal vessels absent. Two pairs of small nephridia per segment. Ovaries in 13. Holandric; spermiductal funnels in 10 and 11. Genital glands present.

Secondary annulation present preclitellarly. Eight setae per segment, closely paired. Nephridial pores absent. Male pores paired, in clitellar region. Clitellum present. Tubercula pubertatis present. Genital fields absent. Papillae present.
Distribution: South Africa: KwaZulu-Natal.

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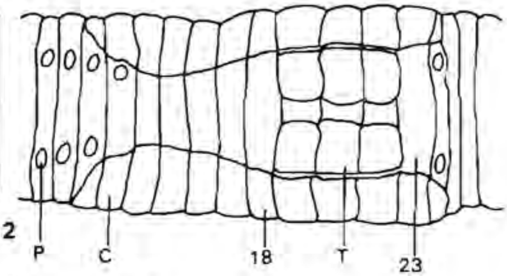
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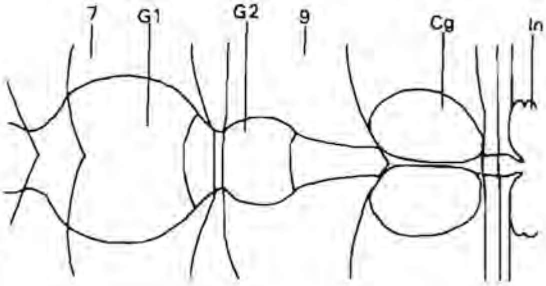
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Figs 1–3. *M. initus* sp. n. 1–2. Clitellar region, ventral view. (C = clitellum; T = tuberculum pubertatis; P = papilla of segment 10). 3. View of gizzards. (G1 = gizzard in segment 7; G2 = gizzard in segment 9; Cg = Calciferous gland; In = intestinum). Numbers in Figs 2 & 3 refer to the segment number.

Michalakus initus sp. n.

Figs 1–3

Etymology: L. *initus* = a beginning. Refers to the initiation of the new genus *Michalakus*.

Material examined: *Holotype*: NMSA/Olig.00868, clitellate, SOUTH AFRICA, KwaZulu-Natal, Albert Falls (29°28'S:30°27'E), Tourist Resort 'Bon Accord', near small stream, grassland, moderately wet soil, 6 March 1991, J. D. Plisko leg. *Paratypes*: NMSA/Olig.000869/1–7, 5 clitellate and 2 juveniles, collected together with holotype; NMSA/Olig.00736/1–2, 2 clitellate, collected 2 km from type locality, near Umgeni River, grassland, wet soil, 6 March 1991. *Other material*: NMSA/Olig.00736/3–18, 9 clitellate and 6 juveniles, from same locality as second paratype; NMSA/Olig.01210, 2 clitellate complete, 3 abscised, 3 juveniles, 4 km from type locality on bank of river, 16 December 1991, JDP & A. Zicsi leg.

Distribution: Known only from the middle section of the Umgeni River Valley in KwaZulu-Natal, South Africa. The natural vegetation there is *Acacia savanna* with some riparian bush and scrub.

External characters:

General: Body cylindrical, soft in life, hardened after formalin preservation. *Colour*: Grey-greenish in life, preserved as whitish-grey. *Dimensions*: Preserved and contracted: holotype 84 mm long, 6 mm wide at 10, 7 mm in region of tubercula pubertatis; clitellate paratypes: 60–90 mm long, 6 mm wide at 10; juvenile 60 mm long, 5 mm wide. *Segment number*: Holotype 108; paratypes: clitellate 97–113; juveniles 94–110. *Prostomium*: Prolobous, small. *Segmentation*: Secondary annulation present in holotype and paratypes: 1 and 2 simple, short, with irregular longitudinal grooves; 3 simple; 4–6 with 2 simple ringlets, similar in size and appearance; 7–9 with 2 ringlets randomly annulated; 10–12 superficially annulated into 2 annuli; clitellar segments, dorsally simple, ventrally irregularly annulated; postclitellar simple, randomly and irregularly annulated. *Setae*: Minute, closely paired; first pair of *ab* visible under high magnification on 7; the following pairs more easily seen. *Nephridial pores*: Not recorded. *Female pores*: On 14, minute openings in front of *ab*. *Male pores*: Not detected externally; probably on 16. *Spermathecal pores*: Not noticeable externally; in dissected holotype, the thin necks of spermathecae were found placed close to 10/11, 11/12, 12/13.

Clitellar region (Figs 1–2, paratypes): *Clitellum*: Saddle-shaped, segmented, whitish-grey; extended dorsally between *ab* setal lines; on holotype 13–23; on paratypes 12, 13–22, 23; *Tubercula pubertatis*: Always on 19–21 below clitellar edges; glandular swellings, divided by intersegmental furrows, with random irregular shallow grooves; rimmed or not, always ventrally clearly separated by distinct narrow field. Segments 18 and 22 distinctly distend. On many larger in size, aclitellate paratypes, well-developed tubercula were noted. *Papillae*: Paired, or not, small swellings in *ab* setal lines, on all or some of segments 10–13, 14 and 23.

Internal characters:

Septa: 4/5 thickened moderately, 5/6 and 6/7 thickened very much, similar in thickness and appearance; 7/8, 8/9 thickened less than 4/5; 9/10 very thin, partly aborted; other septa in preclitellar segments very thin; in posterior segments slightly stronger. *Gizzards* (Fig. 3): Two present; one in 7, somewhat extending into 6, large, muscular, strong; second in anterior part of 9, smaller than first, anteriorly muscular; soft in posterior part. *Calciferous glands*: Present in 10; one pair of dorso-lateral, muscular appendages, widely separated ventrally; dorsally with very slender notch.

Intestine: Commences in 13. *Typhlosole*: U-shaped, large tube; commences in 19; terminates in 57 in holotype, in dissected paratype in 61. *Blood vessels*: Dorsal blood vessel double in 4–11 and partially so in 12; double also at septa 4/5–11/12; in 13 and the following segments single, thick. Ventral vessel very thin in 4–11, enlarged in 11 and the following. Dorso-ventral commissural vessels in 5–7 as thin tubes, in 8 thin-moniliform, in 9–11 thick, moniliform hearts connected with ventral vessel backwards at septa 11/12. *Nephridia*: Two pairs of nephridia per segment in posterior part of the body; dorsal pairs with long, thin tubes; ventral pairs allocated close to median body line, with shorter tubes.

Reproductive organs: *Spermiductal funnels*: Holandric arrangement (in 10 and 11); two pairs of funnels enclosed in separated sacs, closely connected with vesiculae seminales; second pair of funnels always much larger than first. *Seminal vesicles*: Two pairs of moderately sized sacs, closely linked with testical sacs; in 11 and 12. *Spermathecae*: Minuscule, with no diverticula; thin, bent or serpentine tube-like ampullae, close to septa 10/11, 11/12, 12/13; in holotype one pair per segment; in dissected paratypes occasionally two spermathecae per one side were noted. *Ovaries*: In 13; oviducts large, funnel-like, near septa 13/14. *Genital glands*: Four pairs of rosette-like glands, associated with papillae and *ab* setae, in all or some of the segments 10, 11, 12, 13, 23; each gland a composite of 4–5 moderately sized, oval or half oval-shaped structures.

Biological notes: Found in moderately wet, sandy soil in grassland, near a small stream. The collections were made in early summer and early autumn. All samples include aclitellate and clitellate specimens. Observed sperm in the spermiductal funnels suggests that specimens may breed in summer. No casts were noted on the surface of the ground from collection sites.

When alive, all specimens had a dark green tint dorsally. This colouring faded in preserved specimens.

DISCUSSION

The distinctive characters of *Michalakus initus* sp. n., notably the characteristic secondary annulation in the anterior segments, the presence of a double dorsal blood vessel anteriorly, the lack of a subneural vessel, and the presence of one pair of oesophageal calciferous glands in segment 10, confirm the placement of this taxon in Microchaetidae. More than one pair of nephridia per segment in the posterior part of the body, double dorsal vessel in segments 4–11 being also doubled at septa 4/5–11/12, are the characters shared with *Tritogenia*. The possession of more than one oesophageal gizzard is, however, a unique character in Microchaetidae, and indicates the need for a separate genus for this species. The meronephric condition of the excretory system, with its nephridia placed ventrally and dorsally in each segment, two oesophageal gizzards located in two segments separated by two septa, and the lack of lateral longitudinal vessels, distinguish *Michalakus* from the other known microchaetid genera.

The occurrence of multiple oesophageal gizzards, distinctly separated by septa, and the meronephric conditions of the excretory system in *Michalakus,* indicate that the genus has an advanced evolutionary position within the Microchaetidae.

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